PM
TECHNOLOGY UPDATE

The Forest Pest Management Methods Application Group publishes Forest Technology Update semiannually and distributes it nationally to FPM personnel and others interested in forest pest management. The newsletter seeks to link FPM/MAG with field personnel and inform them of program activities and status, current related news, and upcoming models and their release dates. It is available on request to anyone interested in forest pest management.

MAG OVERVIEW AND MISSION

FPM/MAG's mission is to develop and promote improved technology for integrated forest pest management. MAG's objectives are: (1) to provide leadership in identifying, evaluating, enhancing, applying, and transferring technology for Integrated Forest Pest Management (IFPM); (2) to develop computer-assisted technology to interface insect and disease impact data with forest growth and yield models; (3) to develop and maintain impact models for high value forest resources threatened by forest pests; and (4) to provide timely remote sensing data, technology transfer, and statistical assistance to Area/Region FPM field units.

IN THIS ISSUE

UPCOMING EVENTS

Resource Technology 90
November 12-15, 1990
Georgetown University Conference Center
Washington, D.C.

North American National Forest Insect Work Conference
March 25-28, 1991
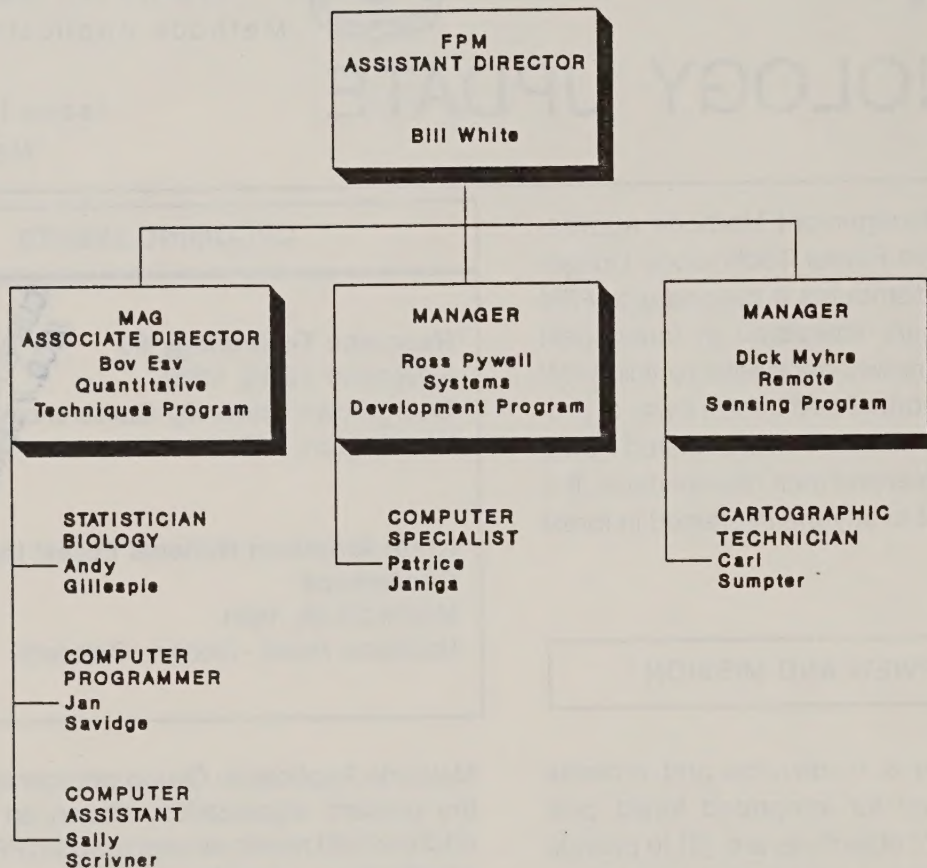Radisson Hotel - Denver, Colorado

Methods Application Group personnel developed the present organization, shown on page 2, to address field needs as expressed in FPM Technology Review, and national needs as outlined in the Strategic Plan for Forest Health. Three programs - Quantitative Techniques, Systems Development and Remote Sensing - address many ongoing and projected future activities. MAG has complemented its staff members' expertise by hiring contractors and other individuals. In addition, the three Program Managers working closely with the Director allows a management team environment. We feel this approach allows us to better serve our many and diverse customers.

It is our desire at MAG to be responsive to field needs but ever aware of national priorities and coordination.

We invite your comments and suggestions on how we can keep you informed and better serve you. Items of interest and comments should be sent to:

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FPM/MAG

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                    │      FPM        │
                    │ASSISTANT DIRECTOR│
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                    │   Bill White    │
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│      MAG        │ │    MANAGER      │ │    MANAGER      │
│ASSOCIATE DIRECTOR│ │                 │ │                 │
│    Bov Eav      │ │  Ross Pywell    │ │  Dick Myhre     │
│  Quantitative   │ │    Systems      │ │    Remote       │
│Techniques Program│ │Development Program│ │Sensing Program  │
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   STATISTICIAN         COMPUTER            CARTOGRAPHIC
   BIOLOGY              SPECIALIST          TECHNICIAN
 ─ Andy               ─ Patrice          ─ Carl
   Gillespie            Janiga             Sumpter


   COMPUTER
   PROGRAMMER
 ─ Jan
   Savidge


   COMPUTER
   ASSISTANT
 ─ Sally
   Scrivner
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NEW STAFF

Ross Pywell

Ross has joined our staff as Manager of MAG's Systems Development Program. Ross and his staff will be responsible for providing leadership in identifying, evaluating, enhancing, applying, and transferring computer-assisted technology for IFPM.

Prior to joining MAG, Ross spent 12 years with the USDI Fish and Wildlife Service in St. Petersburg, FL, Washington, DC, and Fort Collins, CO, where he was involved in the development, implementation, and application of remote sensing and geographic information systems and the integration of spatial data into waterfowl modeling. Ross began his professional career with the Forest Service working as a Forestry Technician for the Northeast Research Station (NE) in Amherst, MA, and as a Forester with the Land Management Planning Team on the Nezperce National Forest. He has a B.S. in Forestry,

M.S. in Resource Planning, and Ph.D. in Forest Hydrology from the University of Massachusetts.

Andy Gillespie

Andy has joined the Quantitative Techniques Program of MAG as a biometrician/statistician. He earned an M.S. and a Ph.D. in Resource Management and Policy (emphasis in Forest Biometrics and Applied Statistics) from the State University of New York College of Environmental Science and Forestry, Syracuse, NY. His graduate research dealt with efficient combinations of sampling and analysis designs for constructing forest biomass tables. While a student, he served as a teaching assistant and as a computer/statistical consultant in the Academic Computing Center of Syracuse University. He comes to Fort Collins from the USDA Forest Service's Institute of Tropical Forestry in Puerto Rico, where he was involved in post doctoral research on the effects of tropical deforestation on the global carbon cycle.

Patrice Janiga

Patrice Janiga has joined the MAG staff as a System Specialist in the System Development Program. Patrice started her federal career with the National Park Service in 1978 as a Group Leader in the Youth Conservation Corps. In 1979 she joined the Forest Service as a co-op student through Virginia Tech. Patrice served on the George Washington National Forest until 1984 when she was detailed to the Land Management Planning Washington Office detached unit in Fort Collins supporting FORPLAN. In 1985 Patrice accepted a Computer Programmer position with the Office of Information Resources Management at the National Computer Center at Fort Collins (NCC-FC). While at NCC-FC she served with the Technical Hotline Service Center, Systems Software Support Staff, and Database Management Applications Development Group. Her experience includes maintenance of FORTRAN compilers, mathematical and statistical products, and data base systems, including ORACLE and INGRES products. Patrice's professional interests include executive information systems, distributed data base implementation, and artificial intelligence applications as they relate to programs throughout the Department of Agriculture.

The following contractors assist and augment the MAG permanent staff:

Janette Evans
Symposium Coordinator, Resource Technology 90
Lance David
Programmer Analyst, Pest Models
Matt Thompson
Computer Programmer, Pest Models
Renee' Platz
Computer Programmer, Pest Models
John Heasley
Systems Ecologist, INFORMS Development
Erin O'Doherty
Park Service Representative, Interagency Resource Lab
Lee Graham
Remote Sensing Development, Airborne Videography Specialist Interagency Resource Lab
Keri Webster
Technical Writer

PROGRAM ACTIVITIES

### QUANTITATIVE TECHNIQUES

Model News...

Thanks to the effort made by the R6 FPM staff and the courageous attitude on the part of the Deschutes National Forest, pest models are being used for the first time in the timber yield projection for input into FORPLAN. The Deschutes National Forest used both the Mountain Pine Beetle and Root Disease Models in developing yields for the revised forest plan.

The Fernan Ranger District of the Idaho Panhandle National Forest in Region 1 undertook a similar initiative this winter. Using the Northern Idaho variant of PROGNOSIS and the Western Root Disease Model, Regional Office and District specialists pushed the limits of the model code and capabilities, and also fully tested the DG Submittal System for construction of production runs, to produce the Timber Resource Analysis portion of the Horizon EIS. The District gained valuable knowledge by applying growth and yield and pest models to real forest conditions. One example was the permanent plot data used for validating the models. Also, involvement of MAG, Washington Office-Timber Management (WO-TM), and Regional personnel at an early stage in the use of models for forest analysis is critical to insure the staff and resources necessary will be available throughout the production process.

A major coordination effort this year between the Intermountain Research Station (INT), WO-TM, and MAG is the update and standardization of computer program code within the PROGNOSIS growth and yield model and all pest models linked to PROGNOSIS. The map on page 4 shows geographic areas and pest models available for those areas. The Data General Submittal System program, user guides, and keyword reference documents have also been updated. All will be available by 3/15/90, and users of the western region pest models should contact MAG to obtain the updated versions (PROGNOSIS Version 6.0).

AVAILABILITY OF PROGNOSIS-PEST MODELS
(Revised 03/90)

1	MPB
2	RD
3	MPB+RD
4	BW+RD
5	MPB+DFTM+BW
6	MPB+BW+RD
7	MPB+DFTM+BW+RD
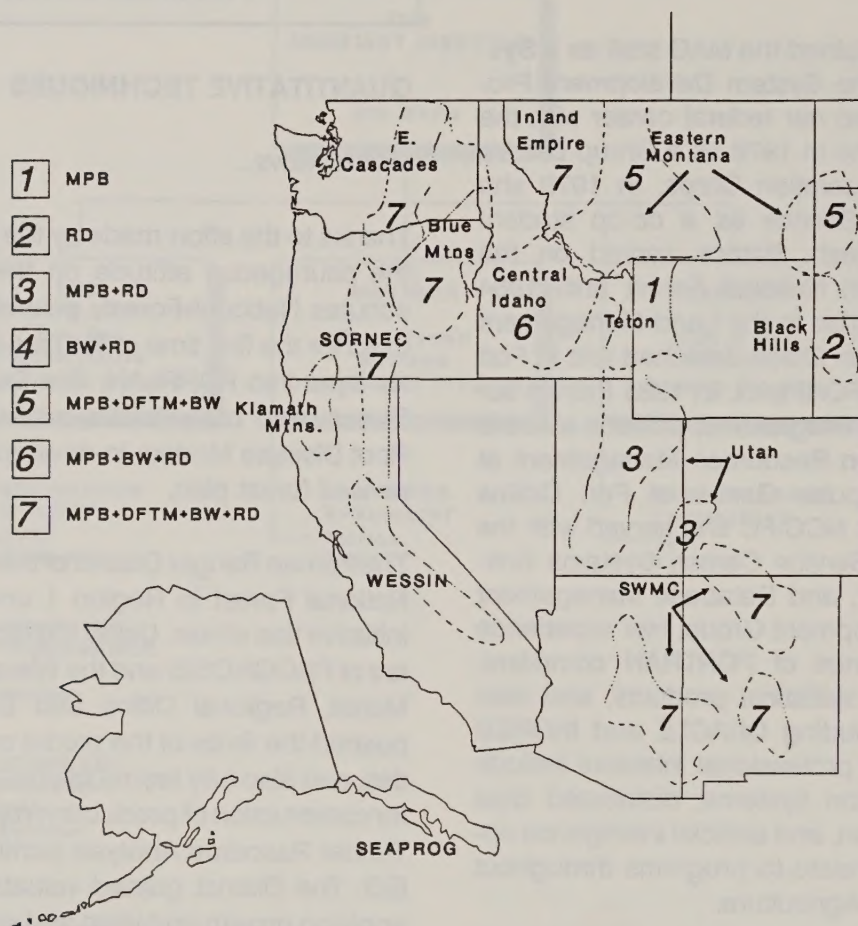
Different pest models are in various stages of revision and validation. R1 FPM is collecting data to test the behavior of the Root Disease Model, while R4 FPM is validating the Mountain Pine Beetle Model. The Dwarf Mistletoe Model is being redeveloped as a cooperative effort between MAG, the Rocky Mountain Station (RM), WO-TM, and several FPM regional staffs. INT, under a cooperative project with MAG and the Rocky Mountain Station, is applying finishing touches to the Western Spruce Budworm Model. Under this two-year project, in cooperation with WO-FPM, the project members will improve some functions in the model and complete documentation.

MAG is also working with RM and New Mexico State University to calibrate the Western Spruce Budworm Model for the southwest. R3 FPM is involved with the foliage characteristics study, while RM is cooperating on the study of host and insect phenol-

ogy. The integration of foliage and phenology study results into the model will be a joint Research-FPM effort.

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Under a combined effort of the Intermountain Research Station (INT), R6 and R5 FPM, and MAG, the Douglas-Fir Tussock Moth Model is being updated, calibrated, and validated.

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4

The first release of the Forest Pest Information System (FPIS) is now available. This package is the Data General (DG) interface for the FPIS System 2000 data base and report generating system resident on the UNISYS mainframe at the National Computer Center at Fort Collins, CO. With this menu-driven system users can load pest data onto the FPIS data base and generate reports from the available data without having to manually access the UNISYS.

The data currently stored in the FPIS System 2000 data base consists of the following:
- Region Code
- Fiscal Year
- Pest Code
- State Code
- Land Classification Code
- Pest Acres
- Pest Volume (MCF)
- Number of Trees Killed
- Number of Southern Pine Beetle Spots

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Douglas-Fir Tussock Moth Traps...

FPM/MAG is currently assisting Regions 1 through 6 and the states within those regions with a continuing evaluation of the early warning detection system developed by the Pacific Northwest Research Station (PNW) under the Douglas-Fir Tussock Moth Expanded Research and Development Program.

FPM/MAG contracts each year with the Foothills Gateway Rehabilitation Center in Fort Collins, CO, for the manufacture of Douglas-Fir Tussock Moth pheromone traps. These traps help determine outbreak potential by capturing male tussock moths during the mating season. The number of moths caught is an indication of the number of larvae that will be present the following spring and the subsequent potential for defoliation. FPM MAG sends a letter to the FPM Directors in Regions 1-6 in January asking their FPM staffs to contact the cooperating states in the region and submit a consolidated order for pheromone traps to MAG. MAG then sends out traps, ties, pheromone, and data entry forms by June to the regions and states.

After the traps are placed in the field in late summer and retrieved in the fall, the captured male tussock moths are counted and recorded on a field data entry form designed by MAG. From this form, regional FPM personnel enter the data, creating a computerized data file which is then transmitted to MAG via DG, floppy disk, or other computerized file transfer methods. At MAG, the data is consolidated to be used in analysis should a future outbreak occur.

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Other Projects Underway...

Wisconsin Maple Decline -- MAG is currently working on a joint project with NA FPM and the State of Wisconsin to analyze a data set dealing with the suspected decline in the sugar maple forest type of Wisconsin. Preliminary results should be available later this year.

Bacillus thuringiensis Pilot Study -- MAG is currently working on a joint project with R6 FPM to study the efficiency of two aerial application treatments of *Bacillus thuringiensis* in controlling spruce budworm outbreaks. This is a two-year project, with field data collection completed. Preliminary results should be available later this year, with more data collection scheduled for this summer.

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REMOTE SENSING

Airborne Videography...

The Remote Sensing Program (RSP) at MAG is evaluating an airborne video system as a potential tool for forest pest management applications. RSP has assembled the following airborne system: a high resolution color camera with three CCD clip image sensors, a high speed electronic shutter, zoom lens, and the new Super-VHS technology; a portable S-VHS recorder; a portable color monitor for in-flight

viewing; a caption generator to superimpose Loran coordinates and time on video tape; and a portable PC (DG-1) to record all latitude/longitude information plus control points and other desired data.

This system was tested and evaluated during the summer of 1989 to determine its capabilities and the potential applications to FPM. With the video equipment mounted in the Beechcraft Queen Air aircraft, the remote sensing staff flew developmental missions in a variety of locations:

Alaska -- The USDA Forest Service and the USDI Fish and Wildlife Service evaluated a special dual video camera system (one vertical and one oblique) in late May over the Bering Sea, west of Nome. This was a cooperative effort between the two agencies to determine the utility of video for a 1990 joint US/USSR walrus survey of the ice pack in the Bering Sea.

Michigan -- The video system was scheduled to be evaluated over an area in central Michigan which has gypsy moth defoliation. This developmental flight was canceled due to aircraft engine replacement; it is rescheduled for July 1990. This is a cooperative effort between FPM/NA (St. Paul Field Office) and FPM/MAG.

Colorado/Utah -- Flights here covered areas containing mountain pine beetle, spruce beetle, Douglas-fir beetle, and spruce budworm activity. Based on what was learned on these flights (optimum flight altitude, best lens focal length, etc.), RSP will plan additional demonstration flights for the summer of 1990. This was a cooperative effort between FPM/Region 2, and FPM/Region 4.

In another cooperative effort with the USDI Fish and Wildlife Service, MAG/RSP collected video imagery of the Poudre River near Fort Collins to gather information on stream habitat.

Texas -- An area on the Davy Crockett National Forest containing southern pine beetle damage was flown at three altitudes to obtain video imagery. Color infrared 9x9-inch aerial photography was also acquired at a scale of 1:8000 for the entire area. The Remote Sensing staff used the video imagery to determine if image analysis technology can be used to create a composite map of the southern pine beetle activity within the area.

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Interagency Resource Technology Laboratory...

The Interagency Resource Technology Laboratory (IRTL) is a cooperative venture among the USDA Forest Service (Forest Pest Management/Methods Application Group), the USDI Fish and Wildlife Service (Technology Development Section), and the National Park Service with the purpose of keeping all agencies at the leading edge of remote sensing technology. The rapid increase in the variety and costs of state-of-the-art remote sensing and image analysis technology makes it difficult for any single agency or unit to stay abreast of all areas of development. IRTL has established ties to similar development centers within the government and universities, creating a technology cooperative that effectively uses limited personnel and equipment resources. The primary goal of IRTL is to evaluate new technology and develop applications which aid technology transfer to the respective field units. The access to advanced technology and technology applications is a critical element in the management of natural resources.

A second function of IRTL is to provide a facility for hands-on training as needed. FPM/MAG's airplane (Beechcraft Queen Air N128Z) serves as the platform for image-gathering to support the various projects.

IRTL is currently equipped with microcomputers (IBM 386/compatible) and workstations (SUN 386) running both MS-DOS and UNIX operating systems. The lab also has access to PRIME and DG minicomputers operating at the USDA Forest Service and the USFWS National Ecology Research Center (NERC) in Fort Collins, CO. Several image analysis software packages are available:

    MIPS
    ERDAS
    TIPS

GIS software is also available, including GRASS, EPPL7, MOSS and ARC/INFO.

Laboratory software is developed and used to capture and preprocess airborne video data, link navigational positioning data to video imagery, and to

model and analyze landscapes. IRTL can do color scanning, color printing, and digitizing.

IRTL has planned a demonstration flight to show airborne video and computer-aided image analysis capabilities in operation. The flight will provide complete video coverage of the Neches Ranger District on the Davy Crockett National Forest in place of the visual aerial surveys. This is a cooperative effort between FPM/Region 8, Davy Crockett National Forest, Texas State Forest Service, and FPM/MAG.

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SYSTEMS DEVELOPMENT

Integrated Forest Resource Management System...

Following the Integrated Forest Resource Management System (INFORMS) Conceptual Design Workshop held December 1988, FPM made three key changes to establish a more cohesive system. First, MAG hired Ross Pywell, Program Manager responsible for INFORMS development, and Patrice Janiga, Computer Specialist supporting INFORMS and related systems. Second, MAG contracted with Andersen Consulting, a systems integration consultant, to review three systems development efforts which serve as models for INFORMS. The three systems are Southern Pine Beetle Expert System (SPBEX), Integrated Pest Impact Assessment (IPIAS), and Integrated Resource Management Automation (IRMA). The purpose of the review was to identify key functions performed by each system, examine programming paradigms used by the developers, identify user interface approaches practiced within each system, and refine resource requirements for INFORMS development. The first draft of the report from Andersen Consulting is being reviewed. Third, MAG's approved work plans include cooperative administration and participation in two regional FPM efforts: a multipest model and EIS support system on the La Grande Ranger District in Region 6, and a pilot INFORMS system on the national forests in Texas, Region 8.

MAG would like to acknowledge the support of Dr. Robert Coulson, John Heasley, and Dr. Douglas

Loh for being exceptionally helpful throughout the systems review process.

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INFORMS Demo-Trainer...

MAG has entered into a cooperative agreement with Texas A&M's STARR Lab to develop an INFORMS Demo-Trainer software system. The objective of the project is to demonstrate key capabilities of two systems currently serving as models to the INFORMS effort. The demo will help FPM staffs communicate with the system development program staff working on INFORMS. The demo will also provide basic training to FPM staffs by exposing them to some of the unique and unusual software capabilities available for natural resource management. The STARR Lab has sent MAG a prototype of the demonstration software. The target completion date for the software is August 1990.

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Jack Pine Budworm Decision Support System...

Fiscal year 1989 was the close-out year to complete the Jack Pine Budworm Decision Support System. MAG, in conjunction with the Northeast Area, administered the cooperative agreement with Texas A&M University to develop the system. Janette Savidge of MAG has guided much of the project administration. Mike Connor has been instrumental in developing and validating rules supporting the system, and troubleshooting on the Hiawatha National Forest. The STARR Lab at Texas A&M, administered by Dr. Douglas Loh, has delivered the software to MAG and Mike Connor. The final test and acceptance of the system is in progress.

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Implementation Status of INFORMS on the Butte Ranger District...

The Butte Ranger District on the Deerlodge National Forest successfully used (INFORMS) during fiscal year 1989. Merrill Davis, District Ranger, has reported that INFORMS helped the environmental assessment process and public meeting facilitation for the Thompson-Basin project.

For analysis, the Thompson-Basin Analysis Area was broken into five subareas based on their unique characteristics and classification under the Forest Plan. Management practice alternatives were developed for the next 10 years for each subarea. The alternatives were designed to meet the desired future condition of each of the subareas over time, as prescribed by the Forest Plan. The impact analyses were supported by several models within INFORMS including the PROGNOSIS growth and yield model, sedimentation, salmonid response to sediment loading, elk use response to roading, the DLOG-PRICE timber sale viability economic model, and a visual sensitivity model. The pest modeling analyses focused on the use of CONTAGION to predict the spread and extent of mountain pine beetle damage in response to stand characteristics.

This assessment project was the first production test of INFORMS. Despite power outages on the district, which caused disruptions to some analyses, the staff persevered. The Butte Ranger District met with MAG for followup support and evaluation of INFORMS production during February 1990. The district ranger has obtained approval from the Regional office to use INFORMS for analyses of a second area.

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OTHER NEWS

VIDEO ON FOREST HEALTH AND EDUCATION MODULES

A video entitled, "Are We Killing America's Forests," was prepared by KUAT-TV and the School for Renewable Natural Resources, both of the University of Arizona. A variety of experts in forest biology and ecology helped prepare the one-hour documentary. A Tuscon public television station aired the video in February of this year. A viewer's guide, brochure, and 1/2-inch cassette version of the program are being prepared for distribution.

FPM and the University of Arizona are currently developing environmental modules to increase environmental eduction efforts by the Forest Service and other natural resource agencies. Each module has several individual lessons and a supporting video. They also tie in with the video, "Are We Killing America's Forests." The first module, "Forest Ecology and Wilderness," is targeted for 5th and 6th grade students and is sponsored by the Forest Service and the Wilderness Society. It has been pilot tested in over 100 classrooms nationwide. FPM and the University of Arizona are planning additional modules on various environmental topics.

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RESOURCE TECHNOLOGY 90

Resource Technology 90 (RT-90), an "International Symposium on Advanced Technology in Natural Resource Management," will take place November 12-15, 1990, in Washington, DC. The conference will focus on new technologies that are currently applicable, globally available, and show integration. The conference is sponsored by eight natural resource management agencies, along with NASA, NOAA, US-AID, Hewlett-Packard, Andersen Consulting, ITRI (Taiwan), and EPA.

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INTEGRATED RESOURCE MANAGEMENT AUTOMATION ON THE NICOLET

Over the past two and a half years MAG has been actively involved in the development of IRMA, a software system designed specifically to support integration of pest management into the project level planning processes on the Nicolet National Forest, Wisconsin. IRMA allows the resource manager to

bring together, in a graphic system, relevant spatial, tabular and management direction information for a particular geographic area where the management practices are being considered. Once the information is in one place, resource managers can examine the consequences of alternative management activities in a particular area. This enables easier documentation of the management decisionmaking process as required by the National Environmental Policy Act. IRMA is progressing through the final test and acceptance phases typical of any software development process. The Nicolet National Forest expects to initially use IRMA through shared access to the hardware host and software housed in the Supervisor's Office. Ultimately the system will be installed at district sites.

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